IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Title: METHOD AND APPARATUS FOR PACKAGING PERISHABLE GOODS

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This application is a Continuation-in-Part (CIP) of 09/074,670, filed on May 8, 1998, the disclosure of which is hereby incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention relates to thermally insulating packaging. More particularly, the present invention relates to an improved method and apparatus for a packaging system with improved insulating, storage and cost effectiveness characteristics for transporting perishables and the like.

Over the last few years, the demand for edible perishables has dramatically increased. The well publicized health benefits of fresh edibles has fueled even greater growth in the demand for such products. Due to the nature of these fresh food products and the desire for off-season supply among consumers, it is frequently necessary to ship such products from remote locations to virtually every corner of the world.

The shipment or transport of perishable goods frequently requires that such materials remain at a stable temperature, which is either elevated or decreased with respect to ambient temperatures to which the packaging is exposed. Because of long transport times for perishable items and the sensitivity of certain of these items due to slight temperature fluctuations, considerable efforts have been made to provide shipping containers with improved insulating

characteristics. Despite the at times satisfactory results of these prior art devices, they have likewise presented a number of drawbacks.

By far the most common material utilized in corrugated containers as an insulating packaging material has been expanded polystyrene (EPS) foam, which is commonly referred to as "styrofoam®". Although EPS has proven to possess acceptable insulating characteristics as a liner inside a corrugated box, for the shipment of perishable goods, use of this material has also required a number of compromises. To begin with, most packaging systems that use EPS liners have required a relatively thick liner of approximately 1 inch. Due to the thickness and density of the EPS materials they add weight to the packaging and increase freight costs while their cushioning effect in the overall packaging system is limited. The EPS liner therefore consumes a significant amount of space that could otherwise be utilized to ship a greater quantity of product.

Leakage from such a container is highly undesirable and can lead to degradation of the container material, weakening of its structural integrity and damage to the transporting aircraft or surface vehicle. Therefore, it is necessary that the EPS liner be formed in such a manner that the chances of such leakage occurring would be minimized. The joining of flat panels of polystyrene by gluing or other means has proven to be relatively ineffective and subject to separation upon jarring of the

container. Molding of the EPS to a single piece liner again introduces additional cost, is not very flexible in terms of varying the size or thickness of the EPS liner. Such molding further requires substantial capital expenditure for each die mold needed to form EPS liners.

In addition, whether stored as flat panels or a molded container, the EPS liners require significant amounts of storage space. Since these liners are generally placed in corrugated type cartons, the user is left with a situation where the corrugated boxes are completely collapsible and can be stored flat and in large numbers without taking up much space, whereas the opposite is true for the EPS liners.

Due to the drawbacks presented by the EPS packaging system, substantial efforts have been directed to providing thermally insulated packaging without the use of an EPS liner. U.S. Patent No. 4,889,252 to Rockom et al discloses the bonding of bubble-type insulation to an inner surface of a corrugated paper box. Because of the direct contact of the bubble-type insulation with the box, much of the potential thermal containment ability of the insulation is subject to being undermined by the conduction of temperatures through the insulation to or from the box and subsequently to or from the ambient atmosphere. Additionally, the box of Rockom is not fully collapsible once the insulation is bonded thereto. Many other recent efforts have been directed at attempting to substitute alternative packaging systems for the EPS

liner.

While some of these systems provide arguably comparable insulating results, they frequently are cumbersome, costly, increase the weight of the overall package and decrease the volume of materials that can be transported in a given container. For example, U.S. Patent No. 5,314,087 to Shea discloses a thermal reflective packaging system that requires at least one spacer insert between an outer and inner container, as well as a spacer tray. Additionally, the pouch of Shea requires a layer of single or double-bubble radiant barrier material to be sealed within a vinyl pouch in an expensive and time consuming procedure.

A number of other known designs have attempted to utilize a bag constructed to nest inside a corresponding corrugated or other outer container. Such bag type constructions have generally not followed the contours of the outer container and have frequently had poor insulating characteristics. As a result, they have generally been either too large or too small for the usually rectangular container that they have been put inside of. As a result, they have often ended up bunched up at the bottom or area location with unwanted excess material at each end wasting productive packing space and adding packaging weight and thereby increasing shipping costs. Likewise, if the bags are significantly smaller than the outer container that they are in, significant packing space is again wasted.

Attempting to consistently vary the size of such bags to match their contents is again another costly and cumbersome experience. In addition, the performance of any insulating container degrades in direct proportion to how tight the container is sealed. Prior art bags have had problems particularly when a liquid was inside of the bag in providing an adequate moisture-proof seal and preventing spillage. Damage to the outer container and/or the material inside the bags frequently resulted. Furthermore, many prior art designs have been designed to perform optimally only when they are not fully loaded with perishable items.

It is therefore apparent that there exists a need in the art for an improved packaging method and apparatus for perishable materials that provides a highly insulative packaging structure that is light weight, less costly for storage and shipping purposes, easily conforms to the shape of an outer shipping container fully collapsible and has thermal characteristics at least as good as EPS in most applications.

SUMMARY OF THE INVENTION

With the foregoing in mind, it is an object of the present invention to provide a packaging system with improved insulating and thermal containment characteristics.

It is a further object of the present invention to provide a packaging which can be retrofitted to an existing transport container to improve the insulating characteristics thereof.

It is another object of the present invention to provide improved insulating packaging that can be constructed of a flat sheet of material to the exact specifications of the outer container that it will be used with in an easy, simple and cost-effective manner.

Yet another object of the present invention is to provide a simple and cost effective method for manufacturing such packaging systems.

It is a further object of the invention to provide effective insulating packaging means for preserving perishable goods which are easy to assemble, light weight, can be shipped and stored flat and unassembled.

It is a still further object of the present invention to provide an insulating container that can be stored in finished condition, flat and can be easily and readily expanded to take the exact shape of the outer container that it is going to be used in conjunction with.

In order to implement these and other objects of the present invention, which will become more readily apparent as the description proceeds, a preferred embodiment of the present invention provides a method and apparatus for a fully collapsible inner container assembly, designed to be removably inserted into an outer

container consisting essentially of a bottom, opposing first and second sidewalls and front and back walls, each constructed of a flexible insulating material having one metalized surface that closely follows the dimensions of the outer container, the first and second sidewalls and the front and back walls forming an integral moisture proof seal with the bottom and each other, an integral first foldable side extending above the first sidewall and having opposing edges, an integral foldable second side flap extending above the second sidewall and having opposing edges, an integral foldable front flap extending above the front end, an integral foldable back flap extending above the back end, a tape strip along one of the ends, and a top formed by folding the first and second side flaps toward each other and folding the front and back flaps toward each other until two of each of their edges become gusseted.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, features and advantages of the present invention will be apparent from the following description of preferred embodiments as illustrated in the accompanying drawings, wherein like reference numbers referred to the same parts throughout the various views.

FIGURE 1 is a schematic view of one embodiment of the present invention.

FIGURE 2 is a cross-sectional view of material utilized by the present invention according to a first embodiment.

FIGURE 3 is a cross-sectional view of material utilized by the present invention according to a second embodiment.

FIGURE 4 is an assembled perspective view of Figure 1.

FIGURE 5 is a schematic top view illustrating all the folds that are made in a flat sheet of material in order to form the present invention.

FIGURE 6 is a top view of the first step required in forming the present invention out of a flat sheet of material.

FIGURE 7 illustrates the next step of forming the present invention out of a flat sheet of material.

FIGURE 8 illustrates the next step of forming the present invention out of a flat sheet of material.

FIGURE 9 illustrates the next step of forming the present invention out of a flat sheet of material.

FIGURE 10 is a perspective assembled view of the present invention.

FIGURE 11 is a perspective view of the first step in collapsing the present invention for storage.

FIGURE 12 is a perspective view of the next step in collapsing the present invention for storage.

FIGURE 13 is a perspective view of an embodiment of the present invention in a flat collapsed form for storage.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings and in particular Figures 1, 4 and 10 the present invention provides an improved packaging transport system for perishables and the like. The invention provides a container 10 that is designed to be removably inserted and closely correspond to the dimensions of an outer container 12 such as a corrugated box. As will be described in more detail to follow, the inner container 10 is designed to be simply and easily constructed from a sheet of material. In its finished form the container 10 closely follows the shape and configuration of the outer container 12. Once constructed the container 10 can readily be collapsed into a space saving configuration for storage and then be subsequently reformed without necessitating further assembly when it is desired to be used.

As illustrated in Figures 1 and 10, the container 10 has a bottom 14 with oppositely disposed ends 16 and 18 and sides 20 and 22 all extending upwardly therefrom. The bottom 14 and ends 16 and 18 and sides 20 and 22 together form a gusseted pouch-like container 10 that will retain both liquid and moisture and prevent leakage therefrom.

The ends 16 and 18 and sides 20 and 22 respectively are designed to extend above the sidewalls and ends of the outer container 12 when the inner container is inserted therein. When the container 10 is used a top 24 is formed by folding the side flaps 25a and 25b inwardly along the fold lines 21a and 21b that are at approximately the same height as the sidewalls of the container 12. The end flaps 27a and 27b are then folded inwardly along the fold lines 23a and 23b over the side flaps 25a and 25b. Alternatively, the side flaps 25a and 25b could be folded over the end flaps 27a and 27b to form the top 24.

The top 24 is sealed by providing a self-sealing strip 26 along or connected to the top edges of one or more of the flaps 25a, 25b, 27a and 27b respectively to form a closed container 10 that fits entirely within an outer container that as illustrated in Figure 4. Other alternative tape or sealing closures could be used in place of or in addition to the self-seal strip 26. The formation and closing of the top 24 results in a tight seal that significantly seals the contents of container 10 off from any air that might otherwise enter through the top of the container 12.

It has been found that the superior sealing of the container 10 attained by use of the strip 26 has been quite important to the overall thermal effectiveness of the container. Since the inner container 10 is designed to be readily constructed to closely resemble the

dimensions of the outer container 12, the container 10 maximizes the amount of useable packaging space for transporting perishable materials within the outer container 12. Additionally, the inner container 10 is designed so that it can be tightly wrapped around its contents whether completely full or not in order to minimize the air space within the container.

Referring to Figures 2 and 3, the inner container 10 is preferably constructed of a material having a metalized polyethylene or metallic foil laminated on one of its sides. One such material is commercially available from Astro-Valcour. Figure 2 illustrates a first preferred material which is a foil laminated bubble pack generally referred to as 28. This material has a sidewall constructed of a thin foil laminate 32 such as metalized polyethylene. The foil laminate 32 is attached to a layer of polyethylene bubble packing material 36 that has a plastic or polyethylene sidewall 38 opposite the foil laminate 32 and features a number of air pockets 34 within the material.

When formed into a container 10 having 1/2 inch thick walls the foil laminated bubble pack 28 has exhibited similar insulating characteristics to EPS foam containers having 1 inch thick walls. In addition, the cost of a foil laminated bubble pack container in accordance with the present invention is often about half of the cost of a similar size EPS container. The foil laminated bubble pack 28 can be used to form the

container 10 with the laminate 32 forming either the inner or the outer sidewall of the container 10.

Most preferred results have been found when the foil laminate 32 is utilized as the inner sidewall of the container 10. A variety of different thicknesses of laminated bubble pack 28 may be used depending upon the requirements of the product to be shipped in the container 10. It has been found that a laminated bubble pack having a thickness of 1/2 inch to 3/16 inch has been particularly effective in certain circumstances.

Referring now to Figure 3, an alternative insulating material for forming the inner container 10 is illustrated. This alternative material referred to generally as 30 consists of a thickness of polyethylene or polyurethane foam material 40 with a sheet of metalized polyethylene or metallic foil 42 laminated to one side of the foam material 40. The material 30 is preferably used with the metalized polyethylene 42 forming the inner wall of the container 10. Again, although a variety of thicknesses of polyethylene or polyurethane foam material 40 have been found effective and the given thickness will depend upon the desired properties for any particular shipment, beneficial results have been found with a foam material thickness of as little as 1/8 to 1/4 inch.

As described above, the container 10 of the present invention is designed to be simply formed from a flat sheet of material such as laminated bubble pack 28 or

laminated microfoam material 30. The formation of a container 10 will now be described in detail with particular reference to Figures 5-10.

Figure 5 illustrates all of the folds that are made to the sheet 13 in order to form the container 10. To begin with a sheet 13 of foil laminated bubble pack material 28 is cut from a continuous roll having dimensions that will form a container 10 of a desired size. In order to determine the proper size of the sheet the dimensions of the outer container 12 that the inner container 10 will be designed to fit in should be known. As can readily be appreciated, the dimensions of the sheet of material 28 can easily be varied and selected to match virtually any size outer container 12.

Referring now to Figures 1, 5, 6 and 10, the sheet 13 of material 28 is cut to a dimension so that the distance between A and B as illustrated in Figure 6 is equal to or slightly greater than the sum of twice the width of the bottom 14 and the height of the individual sides 20 and 22. The opposite dimension illustrated as dimension C-D in Figure 6 is designed to be slightly longer than the length or opposite dimension of the bottom 14 of the container 10. In order to form the container 10, the corner 46 is folded over the remainder of the sheet 13 to a point 61 midway between the dimension A-B. In its folded position the corner 46,

side edge 47 and end edge 48 occupy the new positions designated as 46', 47' and 48' respectively in dashed lines.

As illustrated in Figure 7, a similar fold to the one previously described is next done utilizing the opposite corner 50. The corner 50 is folded over the sheet 13 to a position indicated as 50' where it meets the opposite corner 46'. In this position the end edge 52 has moved to a position 52' butting against the end edge 48'. The end edges 48' and 52' are joined by taping or otherwise securing them together along their entire length. A variety of securing mechanisms can be used for this purpose. Two preferred commercially available mechanisms are two inch filament tape manufactured by Anchor Tape, or use of filament or edge line heat sealer.

In the stage of construction illustrated in Figure 7 a pouch 55 has been formed and one of the ends 16 of the container 10 is outlined in dashed lines. In addition, at this stage of construction a pocket 54 has been formed. That pocket 54 can either be severed and heat sealed along the line 56 using known means or can be folded up in the direction indicated by the arrow and taped or otherwise adhered to the seal 58 that joins the end edges 48' and 52'.

Formation of the container 10 is continued as illustrated in Figure 7 by raising the top edge 64 of the pouch 55 as indicated by the arrow in Figure 1 until the end 16 is substantially perpendicular to the bottom 14.

Next the opposite end 18 of the container 10 is formed by similarly folding the corner 60 inwardly over the bottom 14 of the sheet 13 until it reaches the mid-point 61 of the dimension D. The opposite corner 62 is then folded so that the end edge 72 meets the edge 70 along the line 61. The edges 70 and 72 are then joined by taping or other suitable sealing means across their entire lengths.

A second pocket 74 is likewise formed by the joining of the end edges 70 and 72. As previously described, the pocket 74 can either be cut and heat sealed or folded upwardly along the line 33 as indicated by the arrows in Figure 8 and subsequently taped or otherwise sealed to the outside of the end 18. As illustrated in Figure 11, when the end edges 70 and 72 are joined and the end 18 is resting against the bottom 14 a portion of the side edges 35 and 37 form a top of the end 18 against the bottom 14. The remainder of the end edges 35' and 37' extend upwardly in a substantially perpendicular manner from the bottom 14 and the end 18 in this configuration.

In order to finish formation of the container 10 the top 65 of the end 18 is raised from the bottom 14 until the end 18 extends upwardly substantially perpendicular from the bottom 14 as illustrated in Figure 10. When in the configuration in Figure 9 the finished container 10 can be inserted into an outer container 12 as illustrated in Figures 1 and 4 and filled and sealed for shipment as previously described.

In the alternative, once the container 10 has been fully constructed, it can readily be collapsed into a flat configuration and stored in a manner that occupies a minimum of space. Once it is desired to use the container 10 it can be easily reassembled to the configuration illustrated in Figure 10 in a matter of seconds. The process of collapsing the constructed container 10 for storage will now be described in detail with reference to Figures 11-13.

Referring now to Figure 11, in order to collapse the container 10 for storage the top 65 of the end 18 is folded downwardly along the line 33 until it meets the bottom 14 of the container 10. This causes the sides 20 and 22 respectively to partially fold inwardly. The top 64 of the opposite end 16 is then likewise folded downwardly as indicated by the arrow on top of the bottom 14 along the line 56. When the side 16 is folded completely down it likewise overlaps a substantial portion of the side 18 as indicated in Figure 12.

The action of folding the end 16 down on top of the opposite end 18 completes the formation of folds 76 and 78 that collapse the sides 20 and 22 respectively and form flaps 80 and 82. The flaps 80 and 82 are then folded one over another as indicated by the arrows in Figure 12 to form the final storage configuration of the container 10 illustrated in Figure 13.

In this configuration, the footprint of the container 10 is the same size as the bottom thereof 14.

The collapsed container 10 can then be readily stacked in this manner and requires a space that is only several times the thickness of the foil laminated bubble pack 28 to be stored in a flat space-saving condition. The container 10 then can readily be reformed by performing the steps indicated to collapse the container in reverse order as they were described in connection with Figures 10-13. The compact storage and ease of collapsing and reconstructing the formed container 10 provides substantial advantages over existing EPS containers.

The following examples are given to aid in understanding the invention and it is to be understood that the invention is not limited to the particular procedures or the details given in these examples.

EXAMPLE I

A set of tests were performed in order to attempt to analyze the performance of the present invention compared to other assorted inner insulating containers under various conditions for a fresh food product. The test was designed to measure the insulating ability of containers not refrigerated prior to packing that contained fresh fish and were exposed to a harsh (95°F) environment.

In order to insure accurate results, a number of parameters were held constant for all of the inner insulated containers tested. To begin with, the inner insulating containers were all placed within a regular

slotted single wall "C" flute corrugated shipping container with a mottled white liner. The empty insulating containers were all conditioned together in the same chamber at 95°F and greater than or equal to 75% relative humidity for more than 24 hours prior to testing.

The corrugated containers were sized to maintain an internal volume of approximately 1 cubic foot and were each lined with a 0.003" gauge polyethylene bag. Fresh fish was provided and conditioned together to the same state specifically 36°F and approximately 70% relative humidity for more than 24 hours prior to packing. At that time, 2-3 fish (or approximately 10 pounds) were placed in the bottom of each insulating container and two thermocouples were inserted into and/or placed onto the fish for test cycle monitoring.

Two pound gel packs were provided and conditioned to 0°F for more than 24 hours prior to testing. Two gel packs or four pounds total were placed on top of the fish packed within each insulated container. The gel packs were received frozen but in non-uniform pillow shapes. The units were therefor thawed and then refrozen in a flat orientation to achieve a uniform configuration prior to testing.

All insulating containers constructed in accordance with the present invention were double sealed with a self sealing tear strip as well as an additional strip of 2 inch filament tape, except carton number 6 as noted below. The EPS sheet boxes and chests were not sealed. After packing under ambient conditions nominally 68°F, 50% relative humidity. The seven fresh product containers were placed into a chamber maintained at approximately 90-95°F and 75% relative humidity at the same time.

The test chamber was maintained at a uniform state by means of convection, however, the air was constantly submitted to mixing fan systems running at all times. The recorder monitored the temperature every 30 minutes for the test duration. The insulated containers were retained in the test chamber until all of them reached an internal temperature over 65°F defined as maximum break through time.

The empty insulated packing systems numbers 1-7 were conditioned together in the same chamber and to the identical states, specifically 95°F and greater than or equal to 75% relative humidity for more than 24 hours prior to testing. The following insulating inner containers were tested:

Carton (#)	Insulating Inner Container	Style
1	Present invention-a gusseted bag constructed of a 1/2 inch thick bubble pack with a sheet of metalized polyethylene laminated on the inside of the bag.	Flexible bag
2	Six (6) sheets of 1.0 pound per cubic foot density of expanded polystyrene foam 1/2 inch thick custom cut to line the top, bottom, sides and ends of the corrugated container.	Rigid EPS box from sheets
3	Six (6) sheets of 1.0 pound per cubic foot density of expanded polystyrene foam 1 inch thick custom cut to line the top, bottom, sides and ends of the corrugated container.	Rigid EPS box From sheets
4	A two piece container molded from EPS foam, 1.25 pound per cubic foot density with 1 inch thick walls.	Molded Rigid EPS Chest
5	Present invention-a gusseted bag constructed of a 1/2 inch thick bubble pack with a sheet of metalized polyethylene laminated on the inside of the bag.	Flexible Bag
6	Present invention-a gusseted bag constructed of a 1/2 inch thick bubble pack with a sheet of metalized polyethylene laminated on the inside of the bag sealed with tear strip only.	Flexible Bag
7	Gusseted bubble pack bag 1/2 inch thick without metalized polyethylene lamination.	Flexible bag

The following results were observed

Rank	Carton (#)	Insulating System/Thickness	Max Time
1	6	Present invention, no tape -- 1/2"	19.0
2	3	6 sheets 1#/ft^3 EPS -- 1"	17.5
3	5	Present invention -- 1/2"	17.0
4	4	Molded 1.25#/ft^3 EPS -- 1"	14.5
5	1	Present invention-- 1/2"	14.5
6	2	6 sheets 1#/ft^3 EPS -- 1/2"	14.0
7	7	No metalized laminate -- 1/2"	8.0

As can be seen from the above test results, the 1/2 inch thick metalized bubble container constructed in accordance with the present invention performed better than the 1/2 inch EPS insulation system. The 1/2 inch metalized bubble container constructed in accordance with the present invention performed comparably to both 1 inch EPS insulation systems (sheet and chest). The non-metalized bubble bag insulated container of carton #7 performed significantly worse than the metalized systems constructed in accordance with the present invention.

EXAMPLE II

Another test was conducted to compare the performance of various insulating inner containers where the containers were refrigerated prior to packaging to approximate a cold packing situation. The parameters for this test were the same as those described in Example I

above, except as indicated below. In this test the cartons and their inner containers were conditioned together in the same chamber at 36°F and 70% relative humidity for more than 24 hours prior to testing. The following insulating inner containers were tested:

Carton (#)	Insulating Inner Container	Style
8	Present invention- a gusseted bag constructed of a 1/2 inch thick bubble pack with a sheet of metalized poly-ethylene laminated on the inside of the bag.	Flexible bag
9	Six (6) sheets of 1.0 pound per cubic foot density of expanded polystyrene foam, 1 inch thick custom cut to line the top, bottom, sides and ends of the corrugated container.	Rigid EPS box from sheets
10	A two piece container molded from EPS foam, w.25 pound per cubic foot density with 1 inch thick walls.	Rigid EPS box From sheets

The containers were again tested to determine the time required to achieve a maximum break through temperature of 65°F within the inner container. The results were as follows:

Rank	Carton (#)	Insulating System/Thickness	Max Time
1	10	Molded 1.25#/ft^3 EPS -- 1"	18.5
2	9	6 sheets 1#/ft^3 EPS -- 1"	17.5
2	8	Present invention -- 1/2"	17.5

The test results set forth above indicate that the inner container constructed in accordance with the present invention having a 1/2 inch thick metalized bubble material performed comparably to the containers with the 1 inch EPS insulation systems (both sheet and chest). The conclusions for the samples submitted to the high temperature preconditioning in Example I were about the same for the samples submitted to the low temperature preconditioning in Example II, with the low temperature preconditioning affording an average performance improvement of 1 to 3.5 hours of additional break through time. From these examples it is clear that the present invention was demonstrated to produce very effective desired results.

We claim: